



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

### Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

### About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>



CROSBY'S KEY  
TO  
WILSON AND SONS' EDITION  
OF  
WALKINGAME'S TUTOR'S ASSISTANT;

PRINTED IN 1827, WITH CONSIDERABLE ADDITIONS.

*The Questions and Tables adapted to the New Imperial  
Standard of Weights and Measures.*



~~~~~  
**Entered at Stationers' Hall.**  
~~~~~



## ADVERTISEMENT.

---

THE extensive sale of WALKINGAME'S ARITHMETIC is an incontrovertible proof of its merit. Edition after edition has been so repeatedly required, as to occasion (by the hurry of printing, the inattention of compositors, or the unprecedented demand of the public) a variety of copies, distinguishable only for the errors with which they abound. Conceiving that such a work, thoroughly corrected by an experienced arithmetician, and as attentively revised by a careful typographer, would be highly acceptable, the publishers of this book have given to the world numerous editions of the TUTOR'S ASSISTANT, corrected by Mr. Crosby of York, who had long made the Mathematics his peculiar study, which they are happy to find have been generally adopted in the principal seminaries of learning throughout the kingdom. In consequence of the reception those editions met with, this "Key" was planned, compiled, and published. The sale of eight very large impressions has proved it to be a useful and acceptable supplement to the very meritorious and popular work it is intended to illustrate.

With the assistance of the present undertaking it is presumed, that such persons as cannot have the instructions of an experienced teacher, will be able to improve themselves; the diffident master of a juvenile academy will have a certain criterion on which he may depend; and the more practised and perfect arithmetician will avoid the labour, and consequent loss of time, in working the sum of each of his scholars.

In consequence of the reception these editions met with, Mr. Crosby planned and compiled this Key, being the first attempt of the kind that was given to the public. The Author has bestowed such attention on this work as well as on his corrected edition of the Tutor's Assistant, as he hopes

will ensure them the approbation of his fellow-labourers and their pupils. He has endeavoured to keep the solutions free from ambiguity, and has added Explanatory Remarks, where he thought any thing was not sufficiently obvious. On the Extraction of Roots he has taken more than ordinary pains; and he is indebted to the Diary of Mr. Burrowes, and the Works of Mr. Moody, for the rules he has inserted for performing the Square and Cube Roots.

He has only to add, that no copy of *Walkingame's Arithmetic* contains references to this *Key*, except the editions printed at the press of

**T. WILSON AND SONS,**

*HIGH-OUSEGATE, YORK.*

Every Sum therein he has worked anew, and believes the whole to be completely accurate. It must not be expected, therefore, that this book can answer to any other edition whatever. Such persons as wish to honour *EITHER* with their patronage, are requested to be particular in giving orders for

*WALKINGAME'S ARITHMETIC CORRECTED ;*


OR,

*THE KEY, COMPILED BY T. CROSBY,*

AND PUBLISHED BY

**T. WILSON AND SONS,**

*HIGH-OUSEGATE, YORK.*

 To render this Work still more deserving of the approbation of the Public, a new Fount of Letters and Figures was cast for it, which, the Publishers trust, renders the Book as superior to all others of the kind in point of appearance, as the York Editions of *WALKINGAME'S TUTOR'S ASSISTANT* and the *KEY* have been in regard to correctness.

*YORK, September, 1827.*

# CONTENTS.

## PART I.

### ARITHMETIC IN WHOLE NUMBERS.

	Page.
Numeration .....	13
Integers, Addition of .....	14
----- Subtraction of .....	14
----- Multiplication of .....	14
----- Division of .... ..	17
Compound Addition .....	21
----- Subtraction .....	27
----- Multiplication ....	32
----- Division .....	39
Bills of Parcels .....	45
Reduction .....	46
Single Rule of Three Direct ..	60
Rule of Three Inverse .....	65
Double Rule of Three .....	66
Practice .....	69
Simple Interest .....	89
Commission .....	90
Purchasing of Stock .....	91
Brokerage .....	93
Compound Interest .....	100
Rebate or Discount .....	103
Equation of Payments .....	106
Barter .....	107
Profit and Loss .....	108
Fellowship without Time ....	110
----- with Time .....	112
Alligation Medial .....	114
----- Alternate .....	116
----- Partial .....	117
----- Total .....	119
Position; or, Rule of False... 121	121
----- Double .....	122
Exchange .....	125
Comparison of Weights and Measures .....	128
Conjoined Proportion .....	128
Progression Arithmetical ....	130
----- Geometrical .....	132
Permutation .....	135

## PART II.

### VULGAR FRACTIONS.

Reduction .....	135
Addition .....	141
Subtraction .....	142
Multiplication .....	144
Division .....	144
Single Rule of Three Direct ..	145
Rule of Three Inverse .....	147
Double Rule of Three .....	147

## PART III.

### DECIMALS.

	Page.
Addition .....	149
Subtraction .....	149
Multiplication .....	150
Contracted Multiplication ....	150
Division .....	151
Contracted Division .....	154
Reduction .....	155
The Rule of Three .....	156
Extraction of Square Root ...	158
----- Vulgar Frac-	
tions .....	160
Extraction of Mixed Numbers	161
----- Cube Root .....	163
----- Vulgar Frac-	
tions .....	168
Extraction of Mixed Numbers	169
----- Biquadrate Root	171
Extracting the Roots of all Powers .....	171
Simple Interest .....	172
----- for Days ...	173
Annuities, &c. in Arrears ...	176
Present Worth of Annuities	179
Annuities, &c. in Reversion	183
Rebate or Discount .....	184
Equation of Payments .....	186
Compound Interest .....	187
Annuities, &c. in Arrears ...	189
Present Worth of Annuities	191
Annuities, &c. in Reversion	192
Purchasing Freehold or Real Estates .....	194
Ditto in Reversion .....	194
Rebate or Discount .....	195

## PART IV.

### DUODECIMALS.

Multiplication .....	197
Measuring by the Foot square	200
----- Yard square	201
----- Square of	
100 Feet .....	204
Measuring by the Rod .....	207

## PART V.

### MENSURATION OF CIRCLES 209

## PART VI.

Solutions to the Promiscuous Questions .....	211
Our Author's Table applied	225



## EXPLANATION

OF THE

CHARACTERS MADE USE OF IN THIS KEY.

- $=$  *Equal.* The Sign of Equality ; as, 4 qrs. = 1 cwt. signifies, that 4 qrs. are equal to 1 cwt.
- $-$  *Minus or less.* The Sign of Subtraction ; as,  $8-2=6$  ; that is, 8 lessened by 2 is equal to 6.
- $+$  *Plus or more.* The Sign of Addition ; as,  $4+4=8$  ; that is, 4 added to 4 more is equal to 8.
- $\times$  *Multiplied by.* The Sign of Multiplication ; as,  $4\times 6=24$  ; that is, 4 multiplied by 6 is equal to 24.
- $\div$  *Divided by.* The Sign of Division ; as,  $8\div 2=4$  ; that is, 8 divided by 2 is equal to 4.
- $\frac{2537}{63}$  Numbers placed like a fraction, likewise denote Division ; the upper number being the dividend, and the lower the divisor.
- $: is, :: So is.$  The Sign of Proportion ; as,  $2:4::8:16$  ; that is, as 2 is to 4 so is 8 to 16.
- $\overline{7-2}+5=10$  Shews that the difference between 2 and 7, added to 5, is equal to 10. The line drawn over 7 and 2 is called a vinculum.
- $\div\div$  The Sign of Geometrical Proportion.
- $9-\overline{2+5}=2$  Signifies that the sum of 2 and 5 taken from 9 is equal to 2.
- $\sqrt{\phantom{x}}$  Prefixed to any number, signifies the Square Root of that number is required.
- $\sqrt[3]{\phantom{x}}$  Signifies the Cube, or third power.
- $\sqrt[4]{\phantom{x}}$  Denotes the Biquadrate, or the fourth power, &c.
- i. e.* *id est*, that is.

# KEY

TO THE

TUTOR'S ASSISTANT.

---

## PART I.

---

### NUMERATION.

*Words expressed in Figures.*

- (1) 23      (2) 254      (3) 3204      (4) 25856  
(5) 132245   (6) 4941400   (7) 27157832   (8) 722231504  
(9) 602210500.

*Numbers expressed in Words.*

- (10) Thirty-five.  
(11) Fifty-nine.  
(12) One hundred and seventy-two.  
(13) Two thousand and sixteen.  
(14) Five thousand, two hundred and one.  
(15) Twenty thousand, seven hundred and sixty.  
(16) Five hundred, nineteen thousand and seven.  
(17) Seven hundred, fifty thousand and fifty-eight.  
(18) Five millions, nine hundred thousand and thirty.  
(19) Five millions, two hundred and four thousand and fifty-four.  
(20) Two millions, seventy-one thousand, nine hundred and nine.  
(21) Seventy millions, fifty-four thousand and eight.  
(22) Sixty-five millions, seven hundred thousand and forty-seven.  
(23) Ninety millions, six thousand, one hundred and fifty-seven.  
(24) Two hundred and one million, nine hundred thousand, seven hundred and ninety.

When in the multiplier some two or more adjacent figures are equal to some multiple of another figure therein, the operation may be abbreviated, by multiplying first by that other figure, and then that product by the figure which denotes the multiple, and adding the product together, having placed them so that the first figure of each row or product may stand under the first figure of those in the multiplier, whose product by the multiplicand such row denotes.

## EXAMPLE 1.

$$\begin{array}{r}
 \text{Multiply} \quad 408765 \\
 \text{By} \quad 3612 \\
 \hline
 \quad 4905180 \\
 \quad 14715540 \\
 \hline
 \text{Product} \quad \underline{\underline{1476459180}}
 \end{array}$$

## EXAMPLE 2.

$$\begin{array}{r}
 \text{Multiply} \quad 4675231 \\
 \text{By} \quad 324981 \\
 \hline
 \quad 42077079 \\
 \quad 378693711 \\
 \hline
 \text{Product} \quad \underline{\underline{1514774844}} \\
 \underline{\underline{1519361245611}}
 \end{array}$$

In the first of these examples we begin with multiplying by 12, and then we multiply that product by 3, because 3 times 12 are equal to the next two figures 36; we place the products down as above, and their sum is the whole product required. The other is performed in the same manner.

*Note 2.*—When the multiplier consists of any number of nines, place as many cyphers on the right of the multiplicand as there are nines in the multiplier, from which subtract the multiplicand, and the remainder is the product required.

## EXAMPLE.

$$\begin{array}{r}
 \text{Multiply} \quad 37674658 \\
 \text{By} \quad 999 \\
 \hline
 \quad 37674658000 \\
 \quad 37674658 \\
 \hline
 \text{Product} \quad \underline{\underline{37636983342}}
 \end{array}$$

Here, by adding the cyphers, the multiplier is made one too much, and when 1 is the multiplier, the product is evidently the multiplicand, whence the truth of this contraction is manifest.

## DIVISION OF INTEGERS.

## CASE I.

- |               |                |              |
|---------------|----------------|--------------|
| (1) 362553-1  | (2) 240490-2   | (3) 1802604  |
| (4) 1440657-2 | (5) 871839-3   | (6) 333243   |
| (7) 818415-5  | (8) 2783145-1  | (9) 275001-2 |
| (10) 246410-3 | (11) 2258394-4 |              |

Here, in the first example, we say how oft 2 in 7? the answer is three times, for 3 times 2 is 6, and consequently there remains 1, which carried to the next (2) of the dividend, they make 12; then say how oft 2 in 12? the answer is 6: again, the 2's in 5 are 2, and 1 remains; then the 2's in 11 are 5, and 1 remains; and the 2's in 10 are 5, and nothing remains; also the 2's in 7 are 3, and 1 remains, which placed at the end of the quotient, with a dash between, the whole quotient is 362553-1. The other examples are done after the same manner.

## CASE II.

<i>Div.</i>	<i>Divid.</i>	<i>Quot.</i>	<i>Div.</i>	<i>Divid.</i>	<i>Quot.</i>
(12) 29)	4172377	(143875	(13) 37)	7210473	(194877
	<u>29</u>			<u>37</u>	
	127			<u>351</u>	
	<u>116</u>			<u>333</u>	
	113			<u>180</u>	
	<u>87</u>			<u>148</u>	
	253			<u>324</u>	
	<u>232</u>			<u>296</u>	
	217			<u>287</u>	
	<u>203</u>			<u>259</u>	
	147			<u>283</u>	
	<u>145</u>			<u>259</u>	
Rem.	<u>2</u>		Rem.	<u>24</u>	

*Division of Integers.*

(14) 473)2104721(4449

$$\begin{array}{r}
 1892 \\
 \hline
 2127 \\
 1892 \\
 \hline
 2352 \\
 1892 \\
 \hline
 4601 \\
 4257 \\
 \hline
 344 \\
 \hline
 \hline
 \end{array}$$

(15) 275)3720147(13527

$$\begin{array}{r}
 275 \\
 \hline
 970 \\
 825 \\
 \hline
 1451 \\
 1375 \\
 \hline
 764 \\
 550 \\
 \hline
 2147 \\
 1925 \\
 \hline
 222 \\
 \hline
 \hline
 \end{array}$$

(16) 3701)72109521(19483

$$\begin{array}{r}
 3701 \\
 \hline
 35099 \\
 33309 \\
 \hline
 17905 \\
 14804 \\
 \hline
 31012 \\
 29608 \\
 \hline
 14041 \\
 11103 \\
 \hline
 2938 \\
 \hline
 \hline
 \end{array}$$

(17) 3576)72104725(20163

$$\begin{array}{r}
 7152 \\
 \hline
 5847 \\
 3576 \\
 \hline
 22712 \\
 21456 \\
 \hline
 12565 \\
 10728 \\
 \hline
 1837 \\
 \hline
 \hline
 \end{array}$$

(18) 2510)63210476(25183 (19) 25204)321047217(12737

$$\begin{array}{r}
 5020 \\
 \hline
 13010 \\
 12550 \\
 \hline
 4604 \\
 2510 \\
 \hline
 20947 \\
 20080 \\
 \hline
 8676 \\
 7530 \\
 \hline
 1146 \\
 \hline
 \hline
 \end{array}$$

$$\begin{array}{r}
 25204 \\
 \hline
 69007 \\
 50408 \\
 \hline
 185992 \\
 176428 \\
 \hline
 95641 \\
 75612 \\
 \hline
 200297 \\
 176428 \\
 \hline
 23869 \\
 \hline
 \hline
 \end{array}$$

## *Division of Integers.*

19

(20)  $31709 \overline{) 521047331}$  (16432

$$\begin{array}{r} 31709 \\ \hline 203957 \\ 190254 \\ \hline 137033 \\ 126836 \\ \hline 101972 \\ 95127 \\ \hline 68451 \\ 63418 \\ \hline 5033 \\ \hline \hline \end{array}$$

(21)  $2701234 \overline{) 7210472532}$  (2669

$$\begin{array}{r} 5402468 \\ \hline 18080045 \\ 16207404 \\ \hline 18726413 \\ 16207404 \\ \hline 25190092 \\ 24311106 \\ \hline 878986 \\ \hline \hline \end{array}$$

(22)  $210472 \overline{) 352107193214}$  (1672942

$$\begin{array}{r} 210472 \\ \hline 1416351 \\ 1262832 \\ \hline 1535199 \\ 1473304 \\ \hline 618953 \\ 420944 \\ \hline 1980092 \\ 1894248 \\ \hline 858441 \\ 841888 \\ \hline 165534 \\ \hline \hline \end{array}$$

*Division of Integers.*

(23) 3721071)21071921473(5662

18605355

24665664

22826426

23392387

22326426

10659613

74421423217471

## CASE III.

(24) 271|00)254732|21(939

2439

1083

813

2702

243926321

(25) 5721|00)7253472|16(1267

5721

15324

11442

38827

34326

45012

40047496516

(26) 373|000)752473|719(2017

746

647

373

2743

2611132719

## Compound Addition.

21

(27) 215|000)6325104|997(29419

$$\begin{array}{r}
 430 \\
 2025 \\
 1935 \\
 \hline
 901 \\
 860 \\
 \hline
 410 \\
 215 \\
 \hline
 1954 \\
 1935 \\
 \hline
 19997
 \end{array}$$

### CASE IV.

(28) 3)3210473

(29) 7)7210473

9)1070157-2

5)1030067-4

3 × 9 = 27

118906-11

7 × 5 = 35

206013-18

(30) 7)6251043

(31) 9)5761084

6) 893006-1

6) 640114-8

7 × 6 = 42

148834-15

9 × 6 = 54

106685-44

## ADDITION

### OF MONEY, WEIGHTS, AND MEASURES.

#### MONEY.

£.	s.	d.	£.	s.	d.	£.	s.	d.
(1) 39	6	7½	(2) 385	9	1¼	(3) 388	14	0½
(4) 379	9	4½	(5) 2752	6	11	(6) 2563	3	10½
(7) 315	5	8¾	(8) 424	11	2	(9) 2042	7	6¾
(10) 2168	9	3¼	(11) 306	0	9¼	(12) 164	0	2½

Here, in the first example, we begin and cast up the column of farthings, and the sum is 9, or two-pence and



## TIME.

<i>hrs. m. "</i>	<i>da. h. m.</i>	<i>wk. da. h.</i>
(1) 338 58 48	(2) 380 21 5	(3) 373 5 5
	<i>wk. da. h.</i>	
	(4) 380 5 18	

## THE APPLICATION TO THE FOREGOING.

$$\begin{array}{r}
 (1) \quad 1750 \\
 \quad 47 \\
 \hline
 1797 \text{ Ans.}
 \end{array}$$

	<i>£. s. d.</i>
(2) A laid out .....	7 15 6
B laid out .....	2 9 0
C laid out .....	2 14 6
D laid out .....	0 7 3
Laid out in all .....	<u>13 6 3</u> Ans.

	<i>£. s. d.</i>
(3)	{ 63 0 0
	{ 25 15 0
Lent at different times .....	{ 32 7 0
	{ 15 14 10
	{ <u>99 11 6</u>
Lent in all .....	<u>236 8 4</u> Ans.

	<i>£. s. d.</i>
(4) 21 Guineas .....	22 1 0
8 Score and 19 <i>l.</i> 14 <i>s.</i> .....	179 14 0
	<u>201 15 0</u> Ans.

(5) First number .....	215
Second ditto .....	519
Third ditto .....	<u>734</u>
Sum of them all .....	<u>1468</u> Ans.

# Compound Addition.

25

(6) Paid for goods .....	£54	17	0
— packing .....	0	13	8
— carriage .....	1	5	4
Spent .....	0	14	3
	<u>57</u>	<u>10</u>	<u>3</u> Ans.

(7) Least number .....	40
Their difference .....	14
Greater number .....	54
Sum .....	94 } Ans.

(8) Eleven thousand, &c. is .....	£12111
Add .....	1500
Eldest sister's fortune .....	13611
Youngest .....	12111
Father left them .....	<u>25722</u> Ans.

(9) Owed rent .....	£86	2	0
Wine-merchant .....	72	5	0
Confectioner .....	12	13	4
Draper .....	47	13	2
Tailor .....	110	15	6
Coachmaker .....	157	18	0
Tallow-chandler .....	8	17	9
Corn-chandler .....	170	6	8
Brewer .....	52	17	0
Butcher .....	122	11	5
Baker .....	37	9	5
Wages .....	53	18	0
To these add .....	100	0	0
Total .....	<u>1033</u>	<u>7</u>	<u>3</u> Ans.

		yrs.	mo.	d.
(10) The father's age when his	}	24	0	0
first child was born				
Number of years between	}	1	11	14
each of their births re-		2	1	15
spectively		2	10	25
Fourth's age .....		27	9	12
The father's age at the time .....		<u>58</u>	<u>7</u>	<u>10</u> Ans.